

Atrial fibrillation in patients with ischaemic stroke: clinical characteristics and in-hospital outcomes. A pilot study

Migotanie przedsionków u chorych z udarem niedokrwinnym mózgu
– charakterystyka kliniczna i rokowanie wewnątrzszpitalne. Badanie pilotażowe^{*}, ^{**}

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Abstract

Introduction. Thromboembolic complications are the most severe consequences of atrial fibrillation (AF). AF is associated with significantly worse outcomes in patients with ischaemic stroke. The aim of the study was to evaluate the prevalence of AF, concomitant conditions, and in-hospital outcomes in patients hospitalized due to ischaemic stroke.

Material and methods. Our retrospective study included 2000 patients hospitalized due to ischaemic stroke in 2013–2014. The diagnosis of ischaemic stroke was based on clinical presentations and brain imaging studies (head CT or MRI).

Results. Overall, AF was present in 579 of 2000 patients (28.5%) [AF(+) group]. In 456 of these patients (78.8%), this arrhythmia was diagnosed previously, and in 123 (21.2%) patients AF was newly detected on admission. The mean patient age was 78.6 years in the AF(+) group and 71.6 years in the AF(–) group. Carotid ultrasound was performed in 1,805 patients with ischaemic stroke and showed a critical carotid artery stenosis (> 70%) in 232 patients (16.3%) in the AF(+) group and in 69 (11.9%) patients in the AF(–) group. Major neurological deficit (NIHSS score > 10) on admission was found in 485 patients (34.2%) in the AF(–) group and in 196 patients (33.85%) in the AF(+) group. At discharge, persistence of a major neurological deficit or worsening of the functional status was noted in 224 patients (15.7%) without AF and in 226 (39.03%) patients with AF. Two hundred twenty-nine patients (16.1%) without AF and 90 patients (15.5%) with AF died during hospitalization.

Conclusions. Atrial fibrillation was common arrhythmia in patients with ischaemic stroke. Patients with stroke and AF were older than patients with stroke and sinus rhythm. Critical carotid artery stenosis was more common in patients with AF compared to those without AF, as was worsening of the neurological deficit during hospitalization. In-hospital mortality was similar in stroke patients with AF or sinus rhythm.

Key words: ischaemic stroke, atrial fibrillation, thromboembolic complications

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Introduction

Atrial fibrillation (AF) is one of the most common arrhythmia and one of the major risk factors for stroke, associated with approximately 5-fold increased stroke incidence [1, 2]. It has been estimated that 20–30% strokes are due to cardioembolism, mostly caused by AF. The prevalence of AF increases with age, and AF becomes an independent risk factor for stroke in subjects above 80 years of age especially [1, 3]. Risk factors for stroke in patients with AF are included in the CHA₂DS₂VASc risk score: age above 65 years, female gender, hypertension, heart failure, diabetes, vascular disease, and a previous thromboembolic event [4]. Stroke related to AF is characterized by worse clinical course and outcomes, including higher mortality (about 30% of patients die within 30 days), more disability, and a higher risk of recurrent stroke [3, 5–8]. Identification of risk factors and the cause of stroke allows modification of some of these factors and treatment of the underlying conditions.

The aim of the study was to evaluate the prevalence of AF in patients hospitalized due to ischaemic stroke, compare the rates of concomitant conditions in patients with stroke and AF or sinus rhythm, and evaluate in-hospital outcomes in this patient group.

Material and methods

Our retrospective study included 2000 consecutive patients hospitalized due to ischaemic stroke in a tertiary care neurology centre in 2013–2014. The diagnosis of ischaemic stroke was based on clinical presentations and brain imaging studies (head computed tomography [CT] or magnetic resonance imaging [MRI]).

We analysed data on age, gender, and concomitant conditions such as hypertension, diabetes, lipid abnormalities, and previous thromboembolic event. We evaluate the extent of cerebral infarction based on CT or MRI imaging, and patency of carotid arteries using Doppler ultrasound. Resting electrocardiogram (ECG) was performed in all patients, and Holter monitoring and echocardiography in some patients. Neurological condition of the patients was evaluated using the National Institutes of Health Stroke Scale (NIHSS) on admission and discharge.

Results

The study included 2000 patients with ischaemic stroke. The mean patient age in the overall study group was 73.6 years, and 49.5% of patients were women ($n = 990$). Overall, AF was present in 579 of 2000 patients (28.5%) [AF(+) group]. The AF(–) group included 1421 patients (71.5%) without history of AF.

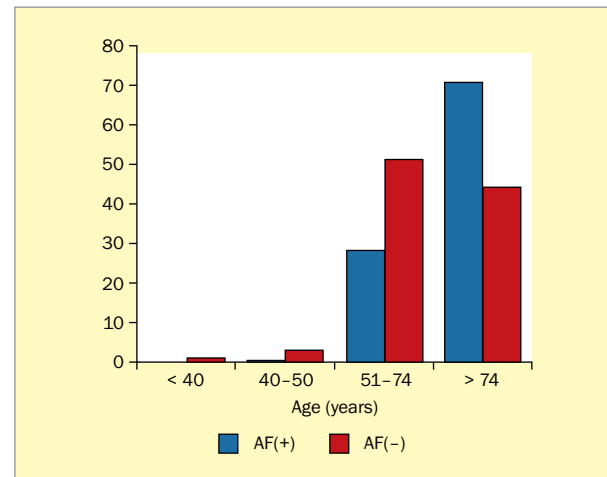


Figure 1. Proportion of patients with ischaemic stroke and atrial fibrillation [AF(+)] versus those with ischaemic stroke and sinus rhythm [AF(–)] in various age groups

Among patients with AF, this arrhythmia was diagnosed before admission in 456 patients (78.8%), and in 123 (21.2%) patients AF was newly detected on admission. The mean patient age was 78.6 years in the AF(+) group and 71.6 years in the AF(–) group. Overall, the study group ($n=2000$) included 18 patients (0.9%) below 40 years of age, 52 patients (2.6%) aged 40–50 years, 893 patients (44.7%) aged 51–74 years, and 1037 patients (51.8%) above 74 years of age. The proportion of patients with and without AF in these age groups was as follows:

- below 40 years of age: 0 vs. 18 patients (1.2%);
- 40–50 years: 1 patient (0.2%) vs. 51 patients (3.6%);
- 51–74 years: 170 patients (29.4%) vs. 723 patients (50.9%);
- above 74 years of age: 408 patients (70.4%) vs. 629 patients (44.3%) (Figure 1).

The AF(+) group included 363 women (62.7%) and 216 men (37.3%). The AF(–) group included 990 women (49.5%) and 1010 men (50.5%). Among 579 patients with stroke and AF, no risk factors for thromboembolic complications included in the CHA₂DS₂VASc risk score were found in 28 (4.8%) subjects, compared to 160 subjects (11.2%) among patients without AF.

Hypertension was the most common risk factor for thromboembolic complications in the overall study group ($n = 2,000$), present in 1,075 subjects (75.7%) in the AF(+) group and in 482 subjects (83.3%) in the AF(–) group. Heart failure was found in 340 patients (23.9%) in the AF(+) group and in 114 patients (19.7%) in the AF(–) group. Risk factors for thromboembolic complications in our study group of patients with stroke are shown in Table 1.

A history of thromboembolic event was found in 115 patients (19.9%) with AF and in 272 patients (19.1%) without AF.

Table 1. Risk factors for thromboembolic complications in patients with ischaemic stroke

Risk factors for thromboembolic complications	Overall		AF(+)		AF(-)	
	n = 2,000	% of patients	n = 579	% of patients	n = 1,421	% of patients
Hypertension	1557	77.9	471	81.3	1086	76.4
Diabetes type 2	520	26	159	27.5	361	25.4
Heart failure	303	15.2	167	28.8	136	9.6
Female gender	990	49.5	358	61.8	632	44.5
Age 65–74 years	462	23.1	115	19.9	347	24.4
Age > 74 years	1,035	51.8	408	70.5	627	44.1
Vascular disease	1,730	86.5	484	83.6	1,246	87.7
Previous thromboembolic event	357	17.9	115	19.9	242	17

AF – atrial fibrillation

Carotid ultrasound was performed in 1805 patients with ischaemic stroke. It showed a critical carotid artery stenosis (> 70%) in 232 patients (16.3%) in the AF(+) group and in 69 (11.9%) patients in the AF(-) group.

Head CT was performed in all patients during the first day of hospital stay, and repeated brain imaging (CT or MR) was performed during the next 3 days in more than 90% of patients. Haemorrhagic transformation was seen in 116 patients (5.8%) in the overall study group, including 29 patients (5%) in the AF(+) group and 87 patients (6.1%) in the AF(-) group. Thrombolytic treatment was administered to 2 patients with haemorrhagic stroke transformation in the AF(+) group and 25 patients in the AF(-) group.

Functional status of the patients was evaluated using NIHSS. Major neurological deficit (NIHSS score > 10) on admission was found in 485 patients (34.2%) in the AF(-) group and in 196 patients (33.85%) in the AF(+) group. At discharge, persistence of a major neurological deficit or worsening of the functional status was noted in 224 patients (15.7%) without AF and in 226 (39.03%) patients with AF.

In our study group of patients with ischaemic stroke (n = 2,000), 229 patients (16.1%) without AF and 90 patients (15.5%) with AF died during hospitalization.

Discussion

Atrial fibrillation was common arrhythmia in patients hospitalized for ischaemic stroke (28.9%). Other authors reported that the prevalence of AF in patients hospitalized for ischaemic stroke was on average 16–26%. In the Warsaw Stroke Registry in 1991–1992, AF was present in 26% of patients with stroke [9]. AF increases the risk of stroke 4- to 5-fold and is the most common risk factor for cardioembolic stroke [6, 8, 10]. Interestingly, in 21% of patients with AF this arrhythmia was newly found at

admission for ischaemic stroke. Staszewski [11] found the same proportion of patients with AF of unknown duration among 838 patients hospitalized due to ischaemic stroke. German Ludwigshafen Stroke Study evaluated 1,231 patients hospitalized due to ischaemic stroke or transient ischaemic attack (TIA). AF was newly detected in 36% of these patients [12]. In our study, all patients had resting ECG recorded on admission, and most patients underwent Holter monitoring. Stroke may be the initial presentation of AF. Silent AF is associated with a significantly increased risk for thromboembolic complications, mostly due to the fact that patients without symptoms of arrhythmia do not receive anticoagulant treatment which largely reduces the risk of stroke and peripheral embolism.

In our study group, patients with arrhythmia were older than those without arrhythmia. Age is an important factor associated with an increased risk of both AF and ischaemic stroke. In our study, subjects above 74 years of age accounted for a particularly large proportion of patients with AF. Other authors also reported that patients with stroke and AF were older than those without arrhythmia [11, 12].

In our study group, the proportion of women was higher in those with AF compared to those in sinus rhythm (62% vs 44%). Similarly, in a Swedish registry (*Riksstroke*) that included 44,173 patients with ischaemic stroke, the proportion of women was higher among subjects with arrhythmia [13]. Female gender is associated with a 1.6-fold increase in the risk of stroke or thromboembolic event. AF is more common in men but the risk of stroke is higher in women [3, 4, 14].

The most common risk factor for stroke in both patients with AF and those without AF was hypertension, which is in agreement with the reports by other authors [11–13]. Hypertension is associated with 4- to 5-fold increase in the risk of stroke. The risk is further increased with concomitant presence of hypertension and AF. Studies indicated

that blood pressure reduction by 12/5 mm Hg reduces the risk of stroke by as much as 30–34% [14–16]. Appropriate antihypertensive therapy plays a major role in primary and secondary prevention of stroke.

Heart failure was found in 15% of patients in our study. Among patients with AF, heart failure was more prevalent compared to patients in sinus rhythm. The association between heart failure and AF is bidirectional in nature. On one hand, heart failure increases the risk of AF, and on the other hand, arrhythmia, particularly supraventricular arrhythmia with rapid ventricular response, may result in tachycardia-induced cardiomyopathy.

Previous thromboembolic event (TIA, ischaemic stroke, or systemic embolism) was found in a higher proportion of patients with AF compared to those without AF. A history of a thromboembolic event is associated with an increased risk of a recurrent episode.

In an analysis that included 2,697 patients hospitalized due to ischaemic stroke, a history of stroke was found in 17% of patients. Multivariate analysis confirmed that in these patients, factors predisposing to recurrent ischaemic stroke include hypertension, AF, and presence of atherosclerotic lesions [17].

Most patients in our study underwent carotid ultrasound to detect atherosclerotic lesions. It showed a critical carotid artery stenosis (> 70%) in 232 patients (16.3%) in the AF(+) group and in 69 (11.9%) patients in the AF(-) group. In a study in 899 patients with AF and stroke, significant carotid artery atherosclerotic lesions were found to be associated with an increased risk of recurrent stroke and 30-day mortality [18].

The rates of haemorrhagic complications as documented in follow-up brain CT did not differ significantly between the two groups. However, more patients without AF received thrombolytic treatment which increases the risk of haemorrhagic transformation. Available evidence

indicates that cardiogenic embolism, mostly due to AF, increases the risk of haemorrhagic transformation even up to 20–40% [8, 19].

Major neurological deficit on admission was found in similar proportions of patients in the AF(+) and AF(-) groups, while worsening of the neurological status was seen more frequently in patients with AF (39% vs 15.7%). Arrhythmia is associated with significantly worse outcomes in patients with stroke. Compared to patients without AF, those with AF are more often found to have early ischaemic changes in brain CT and haemorrhagic transformation in subsequent days, which results in a more severe clinical course of stroke and worse outcomes in these patients [11–13].

In our study, in-hospital mortality was similar in both groups (> 15%). Other authors reported that 30-day mortality in patients with stroke and AF was 25–30% compared to 14–17% in patients with sinus rhythm [11–13]. Lower mortality seen in our study may be related to shorter follow-up, as the duration of hospital stay in our study was 9–20 days.

Conclusions

1. Atrial fibrillation was common arrhythmia in patients hospitalized due to ischaemic stroke.
2. Patients with stroke and AF were older than patients with stroke and sinus rhythm.
3. In our study group, AF was twice more common in women compared to men.
4. Among patients hospitalized due to ischaemic stroke, critical carotid artery stenosis was more common in patients with AF compared to those without AF.
5. Worsening of the neurological deficit during hospitalization was found more frequently in patients with AF compared to those without AF.
6. In-hospital mortality was similar in stroke patients with AF or sinus rhythm.

Streszczenie

Wstęp. Powikłania zakrzepowo-zatorowe są najgroźniejszymi konsekwencjami migotania przedsionków (AF). Migotanie przedsionków istotnie pogarsza rokowanie u chorych z udarem niedokrwiennym mózgu. Celem pracy była ocena częstości występowania AF u osób hospitalizowanych z powodu udaru niedokrwiennego mózgu, ocena częstości występowania schorzeń współistniejących oraz ocena rokowania wewnątrzszpitalnego w badanej grupie chorych.

Materiał i metody. Retrospektywnym badaniem objęto 2000 pacjentów z udarem niedokrwiennym mózgu hospitalizowanych w latach 2013–2014. Udar niedokrwienny mózgu rozpoznawano na podstawie obrazu klinicznego pacjenta oraz badań obrazowych głowy (CT lub MRI głowy).

Wyniki. W całej badanej grupie ($n = 2000$) u 579 chorych (28,5%) występowało AF; chorzy ci stanowili grupę AF(+). U 456 badanych (78,8%) spośród chorych z AF arytmie stwierdzono przed przyjęciem do szpitala, a u 123 (21,2%) pacjentów AF wykryto po raz pierwszy. Średni wiek pacjentów w grupie AF(+) wynosił 78,6 roku, a w grupie AF(-) 71,6 roku. Badanie USG tętnic szyjnych wykonano u 1805 pacjentów z udarem niedokrwiennym mózgu. Badanie to wykazało krytyczne zwężenie naczyń/naczyni (> 70%) u 232 chorych (16,3%) w grupie AF(+) i u 69 (11,9%) chorych w grupie AF(-). Znaczny deficyt neurologiczny (>10 pkt. w NIHSS) przy przyjęciu do szpitala stwierdzono u 485 chorych (34,2%) z grupy AF(-) oraz 196 chorych (33,85%) w grupie AF(+). Przy wypisaniu ze szpitala u 224 badanych (15,7%) bez AF utrzymywał się znaczny ubytek neurologiczny bądź odnotowano pogorszenie stanu funkcjonalnego, a w grupie AF(+) dotyczył on 226 (39,03%). W badanej grupie w trakcie hospitalizacji zmarło 229 pacjentów (16,1%) bez AF oraz 90 badanych (15,5%) z AF.

Wnioski. Migotanie przedsionków było często stwierdzaną arytmia u chorych z udarem niedokrwiennym. Pacjenci z udarem mózgu i AF byli starsi niż pacjenci z udarem mózgu i rytmem zatokowym. Krytyczne zwężenie tętnic szyjnych stwierdzono u wyższego odsetka chorych z arytmia niż z rytmem zatokowym. Pogorszenie deficytu neurologicznego w trakcie hospitalizacji stwierdzano u wyższego odsetka chorych z AF niż bez arytmii. Śmiertelność wewnątrzszpitalna chorych z udarem mózgu była podobna u chorych z AF i u chorych z rytmem zatokowym.

Słowa kluczowe: udar niedokrwienny, migotanie przedsionków, powikłania zakrzepowo-zatorowe

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